

WHAT IS CLAIMED IS:

1. A lens-cleaning device for an apparatus for data transfer with a rotating optical disk, the data transfer apparatus having drive means including a drive spindle to be engaged in a center hole in the optical disk, chuck means for holding the optical disk to the drive means, and a transducer movable substantially radially of the optical disk for data transfer therewith, the transducer having an objective through which a beam of light is thrown to the optical disk, the lens-cleaning device being for cleaning the objective of the transducer and comprising:
 - (a) a cleaner carrier to be replaceably loaded in the data transfer apparatus and placed in the data transfer position therein like the optical disk;
 - (b) cleaner means carried by the cleaner carrier so as to be frictionally engaged by the objective of the transducer when the cleaner carrier is in the data transfer position;
 - (c) there being a clearance opening formed in the cleaner carrier to receive the drive spindle of the data transfer apparatus with clearance when the cleaner carrier is in the data transfer position, the clearance opening being sufficiently large to prevent the lens-cleaning device from being engaged by the chuck means, and hence from being driven by the drive means, when the cleaner carrier is in the data transfer position;
 - (d) whereby the lens-cleaning device when in the data transfer position permits the drive means to overspeed by being not loaded by the lens-cleaning device, from which fact it is ascertainable that the lens-cleaning device, not the optical disk, lies in the data transfer position, and whereby the lens-cleaning device stays out of rotation in the data transfer position, cleaning the objective of the transducer by relative movement thereof with the objective in sliding contact with the cleaner means.
2. The lens-cleaning device of claim 1 wherein the cleaner carrier is in the form of a disk of approximately the same size and shape as the optical disk.

3. The lens-cleaning device of claim 1 wherein the data transfer apparatus is for use with an optical disk cartridge having the optical disk rotatably enveloped in a protective housing therefor, and wherein the lens-cleaning device is provided in the form of a cleaning cartridge, with the cleaner carrier, together with the cleaner means thereon, enveloped in a protective housing of approximately the same shape and size as the housing of the optical disk cartridge, the housing of the cleaning cartridge having a window formed therein to expose at least part of the cleaner means on the cleaner carrier.

4. The lens-cleaning device of claim 3 wherein the cleaner carrier is in the shape of a disk having at least one of opposite major surfaces thereof substantially completely covered by the cleaner means, and wherein the cleaner carrier together with the cleaner means thereon is half fixed to the housing, being capable of forced angular displacement relative to the housing to expose successive different parts of the cleaner means through the window in the housing.

5. The lens-cleaning device of claim 3 wherein the cleaner carrier has part of a surface thereof covered by the cleaner means, wherein the cleaner carrier together with the cleaner means thereon is nonrotatably received in the housing of the cleaning cartridge, and wherein the housing of the cleaner cartridge has an openable lid to replacement of the cleaner carrier.

6. In combination with a lens-cleaning device having a cleaner carrier carrying cleaner means and having a clearance opening formed therein, an apparatus for data transfer with a rotating optical disk, the data transfer apparatus comprising:

- (a) loading means for carrying either of the optical disk and the lens-cleaning device between an eject position and a data transfer position;
- (b) drive means including a drive spindle to be engaged in a center hole in the optical disk when the optical disk is carried by the loading means to the data transfer position, and, with clear-

ance, in the clearance opening in the cleaner carrier of the lens-cleaning device when the latter is carried by the loading means to the data transfer position;

- (c) chuck means for holding the optical disk to the drive means, the clearance opening in the cleaner carrier of the lens-cleaning device being sufficiently large to prevent the cleaner carrier from being engaged by the chuck means, and hence from being driven by the drive means, when the lens-cleaning device is in the data transfer position;
- (d) a transducer movable substantially radially of the optical disk for data transfer therewith, the transducer having an objective through which a beam of light is thrown to the optical disk, the objective being capable of frictional engagement with the cleaner means carried by the cleaner carrier of the lens-cleaning device when the latter is in the data transfer position;
- (e) transducer positioning means for moving the transducer substantially radially of the optical disk; and
- (f) a controller for ascertaining whether it is the optical disk or the lens-cleaning device that lies in the data transfer position, on the basis of whether the drive means is overspeeding by being not loaded by the lens-cleaning device, and, if it is the lens-cleaning device, for causing the transducer to move with the objective in frictional engagement with the cleaner means on the cleaner carrier of the lens-cleaning device.

7. The data transfer apparatus of claim 6 wherein the controller comprises:

- (a) cleaning device detector means for ascertaining the fact that the lens-cleaning device is in the data transfer position;
- (b) lens stick-out means connected to the cleaning device detector means for causing the objective of the transducer to move into frictional engagement with the cleaner means of the lens-cleaning device when the latter is found to be in the data transfer position; and
- (c) transducer shuttling means connected to the cleaning device

detector means for causing the transducer to shuttle with the objective in sliding contact with the cleaner means of the lens-cleaning device.

8. In an apparatus for data transfer with a rotating optical disk, the data transfer apparatus having a drive motor coupled to a drive spindle which is to be engaged in a center hole in the optical disk when the latter is in a data transfer position, chuck means for holding the optical disk to the drive motor, and a transducer movable substantially radially of the optical disk for data transfer therewith, the transducer having an objective through which a beam of light is thrown to the optical disk, a method of cleaning the objective of the transducer which comprises:

- (a) providing a lens-cleaning device having a cleaner carrier which carries cleaner means and which is to be replaceably loaded in the data transfer apparatus and positioned in the data transfer position therein like the optical disk;
- (b) loading the lens-cleaning device in the data transfer apparatus and thereby causing the same to be placed in the data transfer position;
- (c) setting the drive motor out of rotation; and
- (d) cleaning the objective of the transducer by shuttling the transducer with the objective in sliding contact with the cleaner means of the lens-cleaning device, the lens-cleaning device being out of rotation during the cleaning of the objective.

9. The cleaning method of claim 8 which further comprises sticking out the objective of the transducer toward the lens-cleaning device into frictional engagement with the cleaner means thereof preparatory to shuttling the transducer.